become of him. He was found lifeless. He had committed suicide to avoid the performance of an operation with which he was practically entirely unacquainted. We are not aware that the mortality in our army has been increased, in a similar way, by the medical men who have been suddenly attached to it; but what has happened once, may occur again. Perhaps the little books, already referred to, and which have the advantage, so much insisted upon by some persons, of being portable in the pocket, and ready for immediate reference, have, in this respect, indeed, been of some advantage.

We cannot take leave of the books before us without feeling increased pride in belonging to a profession to which humanity owes so much, and which has contributed to successfully diminish the dreadful sufferings of war. In the Crimea were found worthy successors, in both the allied armies, even of such men as Larrey, Percy, and Paré, of Hennen, Guthrie, and Hunter. When we reflect that an endeavour has been made in our Congress to place on a footing with the followers of men such as these, the ignorant and unscrupulous followers of a German charlatan, we have no words to express our indignation. Should such an attempt ever prove successful, no surgeon, who has a due appreciation of his own position, and a proper respect for the great and good men who have gone before him, can remain one moment longer in the service. The impudent fanatics who would now instruct our generals in the art of war, interpret our laws and constitution to the highest legal authorities, teach religion and morals to our most learned divines, and the art and science of medicine to our profession, will be responsible for the consequences. W. F. A.

ART. XII. *Traité d'Hygiène Navale ou de l'Influence des Conditions Physiques et Morales dans lesquelles l'Homme de mer est appelé à vivre et des moyens de conserver sa santé.* Par le Docteur J. B. FONSSAGRIVES, Professor à l'ècole de Médecine navale de Brest. Illustré de 57 planches intercalées dans le texte. 8vo. pp. 770. Paris, chez J. B. Baillière, 1856.

Treatise on Naval Hygiene or on the Influence of the Physical and Moral Conditions to which the Seaman is exposed, and of the Means of preserving his Health. By Doctor J. B. FONSSAGRIVES, Professor in the School of Naval Medicine at Brest. Illustrated by 57 plates, &c.

THE preservation of the health of those persons whose necessities or unfortunate tastes compel them to pass a large part of their lives afloat, is a subject of interest to physicians and statesmen as well as to those who derive their livelihoods and fortunes from maritime pursuits. The circumstances under the influence of which men live in ships, in connection with the diseases from which they most generally suffer and die are worth consideration by medical philosophers, sanitarians, and philanthropists. The seaman of the present day pursues his vocation in less peril than the seaman of a hundred years ago, and his chances of longer life are greater. But he is still exposed unnecessarily to causes of disease, discomfort, and unhappiness, either through the ignorance, or the heedlessness of those who possess the power to remove very many of the obstacles to his well-being. In the commercial marine everywhere, the corporeal interests of the sailor are often sacrificed to the cupidity of ship-owners, and in the naval services of almost all nations to ignorant conceit or love of mere motiveless display and glitter, sometimes found in the cabin or on the quarter deck. We occasionally find men in authority on board ships who fancy themselves endowed with universal knowledge, although entirely ignorant in many departments, who are unwilling, seemingly, to confide in the knowledge of the medical officers associated with them, and for some such reason, treat their hygienic recommendations with indifference, while they unhesitatingly rely upon them to treat disease or wounds. These same men, however, sometimes yield on this subject as a personal favour to the physician what they would utterly deny to his professional authority. There are very many also who respect medical authority and cheerfully adopt suggestions from a surgeon for the preservation of the health of a ship's company.

No benevolent man can contemplate nautical life, in view of its physical and moral privations, and its exposures to the chances of disease and death, both in peace and in war, without feeling that gratitude is due to every one who attempts to lessen the evils which surround it, even in this nineteenth century, when the sailor's condition is vastly improved. Camoëns, who died in 1579, seems to have commiserated sailors in his day.

Curst be the man who first forsook the ground,
And fasten'd canvas to a sapless tree!
Worthy of anguish in the pit profound,
If that true faith I hold religion be.
May never judgment lofty and fecund
Nor vivid genius grace his memory,
Nor sonorous harp his bad exploit proclaim
But black oblivion shroud himself and name.[1]—*Canto* IV. St. CII.

Surgeons in our own ships of war have no authority to enforce measures for the hygienic condition of the vessels on board of which they serve, beyond submitting their suggestions or recommendations. It always rests with the officer in command to adopt or reject them without incurring any legal responsibility. But it might be embarrassing to the service, perhaps, to place any power over the subject in the hands of medical officers, unless such power were limited by a right of *veto* in the commanding officer; but that *veto* might be associated with an obligation to record reasons for refusing to act on the surgeon's deliberate recommendations, to be submitted to the government.

In practice, the duties of a surgeon on board ship are limited to treating the sick and hurt, and keeping a record of his prescriptions. Beyond this he can do nothing without the sanction of the captain. He dare not use a light even, either while caring for his patients or in his own quarters after a stated hour at night, without previously obtaining permission, no matter what may be his nominal rank or experience in the navy. To assert that such permission is never denied, even if it were true, which it is not, is not a satisfactory reason for withholding this much power or privilege; nor is it a conclusive reason to urge that this restriction is a necessary precaution against fire, because every half-hour through the night all lights are visited, except those in the apartment of the captain, and their condition reported to the officer of the watch. Nor can it be easily understood, how a light burning by permission of the captain or officer of the watch on deck, is less dangerous than it would be while burning on the exclusive responsibility of the surgeon.

A ship, like a city, is inhabited by a population composed of people differing in age, professions, degree of mental culture and morbid aptitudes. Like a city, a ship has its mode of structure, its atmosphere, its salubrity, and peculiar alimentation; the necessities of air, water, and light of its population are the same, though satisfied under dissimilar conditions; an analogous system of preserving health, of cleaning and of draining is essential to them; both are at times liable to epidemics which defy the strictest observance of the laws of hygiene.

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[1] The Lusiad of Luis de Camoëns, translated by Edward Quillinan, London, 1853.

Dr. Fonssagrives divides his work into six books, each devoted to the consideration of a branch of the subject. It is proposed to present a summary of them to indicate the scope and nature of his researches.

A ship is a habitation composed of vegetable materials almost exclusively; ships of which the hull is of iron contain considerable quantities of wood, employed in constructing the decks, partition's, &c. It is calculated that a first rate ship of the line contains in its structure about 6000 cubic metres of wood. The injurious influence which such a vegetable mass may exercise when some portions of it, which always happens, are subjected to conditions of humidity and temperature favourable to the decomposition of wood may easily be conjectured.

Old ships, whose worm-eaten ribs fall to mould at the slightest touch, in which destructive animals have excavated numberless galleries reducing their wood to a spongy state and thus multiplying surfaces for contact with water are most unfavourable to salubrity; besides, age separates the seams of ships and permits water, under the influence of considerable external pressure to filter through them as through a sieve, and maintains them in a state of constant humidity which is highly favourable to vegetable decomposition. And what chemical forces might not do, the destructive action of certain mollusks, *tubicolæ*, *teredines*, *pholades*, &c., and vegetable parasites which determine dry-rot, complete, and their organic remains joined to those of the wood, add another element to the fetid exhalations issuing from the lower parts of ships.

The essential elements of wood are *lignin*, *cellulose*, nitrogenous matters and salts.

Cellulose constitutes the frame of the cells and vessels, upon the internal surface of which the lignin is deposited; the azotized or nitrogenous matters and the salts form the principal solids of the sap, which are deposited by evaporation of its water. Certain essences are found amidst these fundamental elements; the pine, the cedar, the guaiac, &c., have their lignin or matter incrusting their cells mingled with resinous substances, which contribute to their preservation; oak contains tannin and gallic acid, other woods contain colouring matters used as dyes or odorous principles, &c.

The elementary composition of wood varies, age, soil, exposure, alike modify it, and as much may be said of different parts of the tree.

The older the wood the thicker the incrusting layers of its canals become, and, as a consequence, the sap containing the nitrogenous elements which, at a later period in vegetable decomposition, play the part of ferments, is excluded. Hence it may be inferred that the advanced age of the ligneous layers becomes at once a condition of durability and salubrity, and hygiene benefits by the architectural rule, which, in the construction of ships, requires the wood of trunks of a certain age to the general exclusion of branches. Inasmuch as the sap-wood decays more rapidly than the true wood, and the liber and cortical layers more rapidly than the sap-wood, the duration and salubrity of the vessel demand that all sap-wood should be carefully excluded from its structure. And it should not be forgotten that wood covered with its bark in the low and humid parts of a ship becomes a true cause of insalubrity.

The season when trees are believed to contain least sap is selected for cutting timber designed for architectural purposes with a view to durability, because experience has proved that the presence of sap in wood accelerates its decay. Means are resorted to besides to season, that is, to dry wood as completely as possible before employing it, but no plan has been entirely successful. Drying by heat was found to render wood liable to crack, to diminish its tenacity, and to increase its hygrometric quality.

Various processes have been adopted and then abandoned to preserve ship timber from decay, but the problem yet remains to be solved. Oxidation and fermentation simultaneously in action are the movements which are destructive to wood. Contact with air favours oxidation, and contact with water helps fermentation. Contact with air cannot be avoided; but if humidity, without which the natural ferments contained in it would be inactive, could be removed, wood might be indefinitely preserved in ships. The comparatively superior durability of wood used in the structure of houses and of furniture is due to the absence of humidity in a greater degree than in nautical structures. And for the same reason, other circumstances being equal, habitations on shore are more salubrious than those afloat. The art of preserving the timber of ships and the art of preserving the health of those who inhabit them seek for means to lessen and destroy humidity, which is the great source of destruction of both wood and salubrity.

The capillary structure of wood renders it absorbent of moisture. To obviate its dilatation through the absorption of liquid from the atmosphere and contraction again when deprived of it through exposure to artificially warmed air, it is covered with paint, which, filling the pores of the wood, hinders though it may not entirely destroy their absorbing property.

Experience taught that vessels built in the open air in wet seasons were much less durable than those constructed in dry weather, because the timber became almost saturated with water which no process tried was effectual in subsequently removing. For such reason the practice of building ships in great ship-houses in which they are sheltered from rain and exposed to the drying effects of free ventilation until launched was instituted and ever since continued. Fortunately for humanity, the efforts made to prolong the durability of ships by having the timber felled in the period of its growth most favourable to its duration, to have it free from sap-wood and bark, and as dry as possible when put into the vessel contributed equally to their salubrity.

It is asserted that the durability of two ships built of the same wood will be in inverse proportion to the time they remain on the stocks, and for this reason, as well as for the sake of economy and the health of those who are to live in them, ships should be constructed very slowly. While building, it is recommended that some strakes of planking should be left off till the last moment, and that as many as possible of the holes bored for the bolts and tree-nails should be left open, and the seams should be left uncaulked till within a few days before launching that the circulation of air may exert its drying influence as long as possible.

Spaces left between the ribs become resting places or reservoirs of confined air and moisture which promote the putrid fermentation of wood, and for this reason those vessels which have solid frames without interstices between the ribs or timbers are most durable and most salubrious.

In spite, however, of all precautions, even the healthiest ships are sites of incessant vegetable decomposition, which is promoted by the heat of the confined atmosphere and contact with water loaded with putrescible matters. Under these influences the wood changes, turns dark coloured, loses its cohesion, and passes to the condition of wood termed *carbonous*, a kind of detritus insoluble in the alkalies, which a degree's further advance in chemical disaggregation will transform into mould or humic acid, which will saturate a solution of potassa. This mould is formed of carbon, hydrogen, and oxygen. M. Malaguti thinks that the nitrogen which analysis discovers is simply interposed between the molecules, and proceeds from carbonate of ammonia absorbed. The passage of wood to the condition of humus does not occur without giving rise to a variety of gases, the phosphorus and sulphur which enter into the composition of the protëic matters of wood intervene in the production of these gases, and there is formed phosphuretted hydrogen which causes the phosphorescence of rotten wood, and sulphuretted hydrogen which imparts to the products of vegetable putrefaction such a repulsive odour. The organic matters contained in sea-water in which the sides of the ship are soaked and those proceeding from animal and vegetable parasites developed in them, also furnish their contingent to the mephitic exhalations which are disengaged from the holds of certain ships. The transformation of wood into mould is never effected except in a partial degree on board ships; it is found complete, however, at certain isolated points in ribs or beams, but most commonly the disorganization of wood is arrested in that condition termed dry-rot.

Cryptogams are parasitic productions developed in preference on organic matters in process of decomposition, because there only they find in abundance the nitrogen necessary to their chemical constitution; hence, from the moment a standing tree dies, or rots after being felled, it becomes covered by cryptogamic vegetations. The wood of ships becomes a prey to them as soon as prolonged humidity sets up the work of internal fermentation; and their sporules extending from point to point by aid of the waters of the hold, kept moving by the motions of the ship, secure the diffusion of those parasites. These cryptogams absorb the juices of the wood, which becomes friable and its aspect justifies the term dry-rot, applied to this condition. The rapidity with which dry-rot destroys wood is shown by the fact that in the Queen Charlotte, a British ship of the line, it committed such ravages in less than two years, that it was necessary to reconstruct her almost entirely. Such was the humidity of this vessel, that a hygrometer (1000° of the scale of which indicated saturation), marked 826.6° in the hold near the pump, and 464.2° only in the external air.

Humidity is the most powerful cause of the destruction of the material of ships, and also of determining the insalubrity of those materials, and it is no exaggeration to assert that the small quantity of water which daily leaks through the sides of a ship, from the sea is no less perilous to the lives of sailors than the tempests against which they are liable to contend. Hence the practice, which has happily fallen into disuse to a great extent in the past few years, of pumping water into the holds is as injurious to the salubrity as it is to the durability of ships.

The metallic materials employed in the construction of ships exert only an indirect influence on naval hygiene. Next to wood in the scale of importance iron stands first. It is used in securing the joints, for ballast, in steam engines, &c. The incessant oxidation of masses of iron must liberate enormous quantities of electricity, to say nothing of that produced by friction of the different parts of engines.

Copper is chiefly employed upon the external surface of the hull. The English frigate Alarm of 32 guns was the first vessel, in 1761, that had the bottom covered with copper. The brass ornamentation on the decks of ships is injurious to the eyes, from the influence of strongly reflected light.

The textile materials of sails and cordage are scarcely less liable to fermentation than wood. Sails when perfectly dry exert no influence on nautical hygiene; but stowed damp in the sail-rooms below, subject to the elevated temperature of the interior of the vessel, a sort of slow combustion occurs in the cellulose of the vegetable tissue, and they exhale a disgusting odour, and become covered with mould.

The general substitution of chain for hemp cables, has been an advantage to the salubrity of ships. They were in use amongst the ancient Gauls. In his commentaries, Cæsar says, *anchoræ, pro funibus, ferreis catenis revinctæ.* Hemp-cables, after soaking in water, and covered with mud of the anchoring ground, were stowed away in the hold of the ship when she put to sea, to dry as well as they might, or become a focus of fermentation and putrefaction to a greater or less extent.

Tar, which is largely employed in ships for the preservation of hempen cordage from moisture, and in calking and sealing joints, seems to exert no definite influence upon nautical hygiene, at least no one attributes disease to the respiration of an atmosphere loaded with the odour of tar.

The kind of paints used is of some importance. In ships of war black and white are the prevailing colours. It is objected that black paint causes wood exposed to the sun's rays to heat to a greater degree than red or white; and that under equal circumstances, a vessel painted white outside would be cooler internally than the same ship would be if painted black, and that this would be more especially notable in iron vessels and steamers. But fashion has determined that the exterior of cruisers must be black; and no argument will soon induce a change in this respect. White is adapted to the interior parts of ships, especially below the deck, because it reflects the light, while a darker hue would absorb it. But it may be well questioned whether some sober tints of cream or slate might not be less irritating to the eyes than glaring white above the deck.

Where paint is used, white-zinc is preferable to white-lead, but neither is as wholesome as white-wash or covering the interior surfaces below the spar deck with milk of lime. Our author suggests that an addition of a small quantity of chloride of lime or hypochlorite of soda to white-wash used in ships might contribute to their salubrity.

When the interior parts of a ship are to be painted, while the crew is on board, a warm dry day should be chosen for the purpose, and men enough should engage in the work to complete it, that the vapour of turpentine may not be long maintained in the atmosphere, because observation has led to a belief that it is very prejudicial to the health of many persons, and some authorities believe that painters working lead paints suffer as much from the influence of the turpentine as from the metallic carbonate.

Under the denomination of ship's stores, besides sails and cordage, are ballast, fixed and movable, the former consisting of iron and the latter of stones which may be thrown away when cargo is substituted; coals as well as fatty materials and oil, which are largely used for lubricating machinery in steamers, all of which are more or less liable to spontaneous combustion. The various questions of hygiene of steamers in this connection are yet to be investigated and decided.

Dr. Fonssagrives suggests that a comparatively low degree of temperature may cause coals stowed in a ship's bunkers to give off slowly the same products which are obtained by distilling tar in the manufacture of illuminating gas, namely, carbonic acid, nitrogen, oxygen, bicarburetted hydrogen, which gases become impregnated with ammoniacal, sulphurous and tarry vapours, that are eliminated by proper treatment in the gas manufactories; but slowly eliminated and diffused in the atmosphere of the ship, they may be very detrimental to the health of those forced to respire it.

The local hygiene of different parts of a ship is minutely considered. In all ships the space beneath the lowest deck, where there are several, is called the "hold." It is in ships of war the grand reservoir for the reception and storage of water, provisions and stores of almost all kinds. In relative situation and uses it is analogous to the cellars and vaults of dwelling houses.

The hold being the lowest part of the ship is the receptacle of all water which may leak through the bottom. It is divided longitudinally by the keelson, along each side of which, arrangement is made for the flow of water from both extremes to the pump-well which is the lowest level within the vessel. The spaces between the timbers near the keelson are called the limbers, which are prone to become incumbered with detritus and dirt from various sources. These are generally organic matters; which soon ferment and give rise to gaseous emanations which more or less contaminate the atmosphere. In times past, a rope or chain was extended along through holes in the limbers properly arranged for the purpose, keeping the passage between the limbers free, by drawing them alternately fore and aft. But in modern times limber-ropes have disappeared almost entirely. The limbers are kept closely covered, and are inaccessible without removing the iron ballast, and fresh water-tanks which are made to form a tight covering for the lining of the hold.

At the bow and stern are placed powder magazines, accessible from the orlop or berth-deck. Spaces are left on each side of the magazines, termed wings, and also beneath them, which are occupied by store-rooms. Near the centre are placed the chain-lockers, shot-lockers, and shell-rooms, and toward the stern are the spirit-room and bread-rooms. Salted beef, pork, rice, sugar, &c. &c. in barrels are packed on top of the tanks with fire-wood, from which the bark has been removed prior to taking it on board.

In steamers a large part of the centre of the hold is occupied by the engines and coal bunkers, which renders the arrangement of the hold in them necessarily different from that of sailing ships. But whatever this may be, four conditions are necessary to the salubrity of the hold.

1. The storage should be so methodically combined that everything may be at hand, and require as little moving and changing as possible.
2. Hatches and windsails should be so arranged as to favour free and active ventilation.
3. Water should not be permitted to stagnate or accumulate in any part, and its removal should be made easy.
4. Provisions and stores should be packed in a manner most favourable to their preservation.

Cocks or spigots, communicating through the bottom of the ship with the sea, are placed in all public ships, through which water may be admitted for the purpose of washing and cleansing the hold, by floating every kind of detritus into the pump-well from which it may be removed.

However efficient such a contrivance may be in washing the interior of the hold, it should be sparingly used, because the difficulty of drying the hold again after being thoroughly wet is so great that moisture lingers many days sometimes, and contributes to the process of fermentation of organic matters subject to its influence. As long as dirt is perfectly dry it is comparatively harmless, and becomes offensive only after it has been moistened. When these bilge-cocks are opened to admit sea-water, the pumps should be at the same time set in motion to remove it from the pump-well where it very speedily accumulates.

In French ships of war there is in the forward part of the hold an apartment called the "cambuse," into which are placed the rations for the day and from which they are issued to the cooks, and to which plates and cans are returned after meals to be cleansed.

The orlop-deck in ships of the line and berth-deck in frigates, sloops, and smaller vessels, is the basement story of the maritime habitation.

All hygienists agree, says Dr. Fonssagrives, that the basement of our houses are much less salubrious than the upper stories, on account of its vicinity to the ground and the less purity of the inferior strata of the atmosphere. The berth-deck of ships presents analogously, like unfavourable conditions. From their capillary porosity, its partly submerged walls derive an inevitable humidity which is augmented by water too frequently used in washing the deck, by rain, &c.; its position immediately above the hold exposes it to emanations disengaged from the latter; and the air as well as light reach it only from above downward, amidst a thousand intervening obstacles, so as to render the renewal of the interior atmosphere very difficult. The insalubrity of the berth-deck increases with the rate or size of the ship.

In ships of a single battery the after part of the berth-deck is occupied by the cabin, the ward-room in which the commissioned officers lodge and mess, the steerage for the accommodation of midshipmen, and the apartments of warrant officers, namely, boatswain, gunner, carpenter, and sailmaker. The part of this deck not assigned to the officiality of the ship is occupied by the crew. And the extreme forward part is appropriated to the hospital or sick-bey in public ships of the United States, but in the French navy a more eligible position, near the centre of the deck, or in frigates on the forward part of the gun-deck, where there is better ventilation and light, is assigned to the hospital. A half century ago, sick men seem to have been regarded in the French as well as in other navies, as useless beings, who are to be put as far out of the way as possible.

In 1810, M. Sper de Granville, a French naval surgeon, published a thesis entitled *Essai sur le Service de Santé Nautique*, in which he described the inconveniences of the forward part of the berth-deck for hospital purposes, and pointed out the superior advantages of the forward part of the gun-deck. It was objected to his views that taking that part of the ship for a hospital two guns would be thrown out of exercise; that the light left with the sick during the night would be dangerous; that smoke from the galley or kitchen, the odour of the "head," draughts of air, and humidity from sea-spray would be dangerous to the sick, and the aspect or uniform appearance of the battery would be injured. To the latter objection M. Sper replied: "What! place in competition the mere appearance of the battery with the health and even existence of men! The officer who makes such an objection manifests at once the degree of interest he is capable of taking in the welfare of the crew." In 1822, this idea of M. Sper was fully developed by M. Le Helloco, and in 1825 the point was gained and an ordinance was issued which put the question at rest.

The galley or cooking apparatus is placed on the forward part of the berth-deck in sloops, and on the gun-deck of frigates. On the berth-deck, the galley contributes to the ventilation, and this effect more than compensates for other inconveniences its presence there occasions.

In frigates, and larger ships, a great many men sleep on the gun-decks, where they have a better atmosphere than is usually found on the berth or orlop-decks.

The upper or spar-deck is the parade ground and scene of action of the floating population, and, being exposed to the free air and light, requires little consideration from the hygienist or sanitarian.

The second book of the work of Dr. Fonssagrives is devoted to the man of the sea, and embraces recruiting, habits, vocations, and marine labours.

To determine the physical force of a crew, a *dynamometer*, which consists of an elliptical spring, acted upon by pressure, to ascertain *manual force*, and by traction, to ascertain *renal force*, or strength of back, is suggested.

A table of the results of experiments by M. Quetelet is given, the deductions from which are: 1, that muscular force increases up to forty years; 2, that renal force diminishes at an earlier age than manual force; 3, that the renal force of a seaman of fifty is equal to that of a novice of sixteen; 4, that those of slightly advanced age, or of very advanced age, equal each other in the development of muscular force.

The tables of M. Quetelet show that renal force doubles from eleven to fifteen, becomes triple between fifteen and forty, and then decreases; that manual force follows a nearly analogous progression and decadence. It is therefore desirable that the crew of a ship should not be composed of men too young; without considering nautical inexperience which is their lot, is there not danger in subjecting men whose development is not yet complete, to the hardships and crowding which are incident to navigation?

Nautical conscripts of France are required to serve between the ages of eighteen and fifty, or, at the utmost, thirty-two years, or the entire term of the full vigour of muscular force, if the deductions of M. Quetelet are reliable.

The seaman is exposed to the most varied and most vehement passions; he often passes from the most insipid monotony to the most amusing variety, from joy to sadness, from satisfaction to discontent, from calm to agitation, from idleness to painful labour, from safety to peril, from hope to despair; abundance follows want, excesses succeed privations. These emotions, by their multiplicity and activity, exhaust sensibility, and hence we see the seaman insensible and passive, when any other man would become disturbed and excited.

Sea life too is frequently destructive of family ties; our fragile and precarious affections, like everything human, are prone to diminish, and need the constant presence of those who inspire them to keep them warm; similitude of tastes, the guarantee of solid conjugal intimacy, often gives place to incongruous habits, acquired during separation; the supreme control of the family—in all that relates to the education of children, and care of their patrimony—is no longer in legitimate hands; in a word, sea life is a most absolute overturning of the harmonious system of family management. Impressible and loving natures find in this chilling of their instincts, a source of sadness, inquietude, and discouragement, which is fostered even by letters—fragile bridges thrown over the sea between the ship and domestic hearth—and this the hygienist will not fail to consider. To listen to the heedless language of sailors, the little reverence with which they speak of things the most sacred, the facility, in some degree fortuitous, with which even on the eve of departure they contract unions, the gravity of which they little comprehend, and to see their spirit of gayety, one would suppose them to be careless, and strangers to the sorrows of absence and to family regrets; but the sagacious physician can distinguish the man under his borrowed envelop, and is not ignorant that nostalgia often selects those who would conceal it.

Drunkenness, the most ignominious of all the passions—because it enslaves body and soul, kills intelligence, extinguishes the will, and hastens decrepitude—is the sailor's curse, in which health, vigour, and the well-being of the family are foundered. And it is surely incongruous that governments should encourage this vice by contributing alcoholic stimulants as a part of the daily food of seamen, and thus create the appetite in the young, and foster it in the mature, while they enact laws to punish those who intoxicate themselves, as well as those who commit the offences which excess in drink originates. The writer believes that the abolition of the spirit ration of the navy would contribute more to the elevation and efficiency of the service than any other one act of legislation could do. The physical, moral, and intellectual diseases consequent upon the intemperate use of intoxicating drinks, are too well known to the profession to require here a quotation of the author's statements in connection with the subject.

The influence of drunkenness upon discipline is of daily observation, as shown in men exceeding their period of liberty on shore, quarrels, insubordination, &c., all effects of this vice, which has merely a temporary check in want of money, or confinement on board. Most offences being consequent upon drunkenness, there follow in its train punishments which are prejudicial to health, such as deprivation of liberty, of air, food, close confinement, &c.

Prolonged abstinence from indulgence in the genetic appetite, disturbs the equilibrium of the functions; but it may be added that the inconveniences flowing from this cause are less than those which result from abuse of the sexual relations. This is especially true in warm countries, where the genital sense, stimulated beyond measure, acquires undue activity, and the economy already exhausted by overpowering heat, slowly repairs the double —humoral and nervous—expenditure which it imposes. M. Celle probably exaggerates when he declares that "sexual pleasures have certainly killed more men than drunkenness."

Syphilitic diseases are very prevalent among seamen. In the years 1852 and 1853, at Brest, out of a mean force of 1641 men, there were annually 443 venereal cases, or 26.9 per cent.* In public ships of the United States, the number of cases, although considerable, bears a very much smaller proportion to the number of men.

There is another kind of genetic excess which profanes the laws of nature, and ignores the sexual duality of the species, to which our author calls attention—an excess which is extremely rare in the navy of the United States, though it is believed that among boys onanism is not unfrequent.

Many professions and labours are embraced in a ship. The officers constitute the aristocratic class of its population, a class which has its privileges of consideration and authority, and also its responsibilities, cares, and anxieties. Although Dr. Fonssagrives properly refrains from individualizing the members of this class, he feels at liberty to speak of the surgeon, the man to whom the State confides the health of the floating colony—a detached portion of the mother-country. His duty is hard. From the moment the ship weighs her anchor, he alone has the undivided responsibility of the lives of those whom the State confides to his care In the midst of those anxieties—which an unexpected case may cause—he is deprived of recurrence to another to sustain him ; his only resource is in books, the insufficiency of which is cruelly felt at critical moments. Hygiene, medicine, surgery, toxicology, legal medicine, are distinct specialities among practitioners on shore; the surgeon of a ship, under the penalty of being considered unequal to his task, in case of failure, is bound to provide for private and public prophylaxis, direct the treatment of internal diseases, be ready for great surgical operations, enlighten at need the most arduous cases of judicial medicine. He ought to be a *physician* in the broad acceptation which antiquity attached to this word; to meet the exceptional exigencies of his position, it is not enough that he shall have passed the frequent tests to which the naval surgeon is subjected, in passing through the different degrees of his hierarchy; indefatigable, constant labour alone can maintain the degree of knowledge he has painfully acquired, and his life is passed amidst the agitations of competition, the fatigues of the sea, and toil without relaxation, which conscience imposes on him as a duty. His task is difficult, under ordinary circumstances; deficiency of space, the instability of the ship, the penury—do what he may—of alimentary resources, obscurity, noise, humidity, are the opponents against which he is in constant contention. But when an epidemic appears, his difficulties increase, and are only met by increased courage and energy. That is his field of battle, where danger presents itself, without the excitement which shades, or the glory which compensates it. It belongs to others to say whether a surgeon of the navy ever recoiled through fear, and whether our corps cannot, after every such scourge, reckon with pride a duty well discharged even with the cruel losses it cost. Let us add, says Dr. Fonssagrives, that the surgeon finds compensation and a lightening of the difficulties of his ministration in the high esteem and personal consideration of which he is an object, and in the readiness with which commanders and officers second his efforts to stay the ravages of an epidemic.

The officers stand in the same relation to sailors afloat as those of the liberal professions in our cities to those who exercise mechanical trades or labour with their hands. Although they are better lodged and enjoy greater variety of food, they feel often severely the moral miseries which are inherent to navigation; separation for long periods from family and friends; incompatibility with those with whom they are closely associated in their duties; the rigid formalities of discipline; sense of responsibility, the devouring anxieties of ambition reduce the morbid aptitudes of the officer to that of the sailor and expose him to diseases, almost wholly unknown amongst the crew.

In a hygienic point of view, all the professions exercised on board ship are divided into three classes.

1. Professions exercised principally in the open air.
2. Professions exercised principally in the interior of the ship.
3. Professions exercised habitually under exposure to fires.

The professions which are exercised in the open air are those of seamen, ordinary seamen, boatmen, boys. These generally speaking are the most healthful of the vocations. In an epidemic yellow fever on board of the Herminie at Havana, the topmen furnished 25 per cent. of the patients, while the mean of other grades was 28 per cent., and some among them, "holders" and supernumeraries, it attained 66 per cent.

Boatmen are more exposed to the causes of disease than topmen. Violent or long continued exercise in rowing often is succeeded by repose in the boat, which exposes them to be chilled in cool winds while freely perspiring; or they have to remain under the influence of a burning sun; or to wade knee-deep in water sometimes in landing on beaches. Boat-service is among the most fatiguing and insalubrious in which men are employed in the open air.

Of the second class, those who work in the hold suffer most in health. The holder is easily recognized on inspection at muster, by the pallor of his complexion, the œdematous puffiness of his cheeks, and that appearance of etiolation and general debility which a few months' sojourn in the hold are sufficient to bring. Proportionately the holders furnish nearly double the number of patients of any other vocation in the second class. This increased liability to disease is not due exclusively to the privation of pure air and light; the slow poisoning from respiring the sulphhydric miasms which are disengaged in the depths of the ship, must also be taken into account.

Our author suggests that "holders" should not be a permanent class, but should be relieved periodically and be required to sleep always in some well ventilated part of the ship; and that quinia in small quantities should be administered to them regularly as a prophylactic.

Cooks, bakers, firemen, and coal-heavers suffer in health on board ship more than men of any other class. The elevated temperature to which they are exposed augments their aptitude to disease. Acceleration of the circulation and respiration, and copious perspiration are among the immediate effects of the influence of heat, and men become anæmic and liable to affections of the heart, ophthalmias, diarrhœas, and acute diseases of the air-passages.

In the French navy there is no marine corps. It is possible that this institution may disappear from the navy of the United States, because sailors are fast becoming as expert as the marines in infantry tactics, and when they shall be, the marine corps may be advantageously transferred to the army.

Several pages are appropriated to a consideration of rest. Men on board of ships of war, besides working or manœuvering, cleaning, and provisioning the vessel, are employed in drill at the great guns and with small arms; and in some instances, health is lost sight of in the anxiety of the commander to astonish beholders by the rapidity and precision of the various drills of the crew. In the exercises of reefing, furling, sending down spars from aloft men are sometimes killed or maimed in their efforts to accomplish the work within a limited number of minutes.

In the French service the physiological fact is recognized that children and minors require longer periods of repose than adults to maintain them in health, and for this reason a regulation prohibits boys from keeping night-watches.

The subjects of clothing, lodging, and personal hygiene are treated in the second chapter of the second book.

The French sailor's sack or clothing outfit required by the government is thus stated.

Quantity.	Articles.	Cost of each.	Total cost.	Estimated duration.
		fr. c.	fr. c.	months.
2	Cloth jackets	14 75	29 50	18
1	Loose sack (caban)	23 55	23 55	30
2	Cloth pantaloons	11 65	23 30	12
2	White linen pantaloons (duck) . .	3 75	7 50	9
2	Fatigue trowsers, linen . . .	3 55	7 10	12
1	Jumper (vareuse)	3 40	3 40	18
1	Pair of gaiters, white linen . . .	1 15	1 15	6
4	Shirts, white linen	2 95	11 80 .	6
1	Swanskin shirt	6 45	6 45	18
1	Large sack	2 20	2 20	36
1	Small sack	1 80	1 80	36
1	Fatigue cap	2 45	2 45	12
2	Pairs woollen stockings . . .	2 40	4 80	9
2	Pairs of shoes	5 10	10 20	4
1	Pair jugulars	10	10	12
1	Woollen neck-cloth	1 45	1 45	18
1	Lasting neck-cloth	1 45	1 45	12
1	Clothes' brush	35	35	36
1	Scrub-brush	35	35	12
1	Shoe-brush	35	35	24
			139 25	

The cost of this entire outfit of clothing is $26.46.

Dr. Fonssagrives urges that under flannel vests and drawers should be added to this outfit and that cotton should be substituted for linen shirts, which should be made in such manner as to protect the chest.

Between officers of the line and medical officers there is always a discussion whether shoes should or should not be worn by sailors on board ship. Our author insists the shoes should be worn.

He also remarks that the short jacket is a cause of lumbago, because between its bottom and the waistband of the trowsers there is a space through which the shirt appears, and at that point the back is comparatively unprotected. For this reason, he suggests the wearing of a red flannel belt or sash of several turns around the body for the protection of the loins. He recommends a straw hat in place of the stiff-glazed or waxed black hat worn by French sailors, which is uncomfortable and unsightly; and that the uniform caps worn by officers should be provided with vizors, broad enough and long enough to shield the eyes from glare of light, and to shade the nose from the sun. He condemns the cocked-hat *in toto.*

The outfit of the sailor in the navy of the United States is much more in conformity to the laws of hygiene. It is as follows:—

1 pea-jacket . . .	$11 00	1 seamless cap . . .	1 00
1 blue cloth trowsers . .	3 39	1 black silk handkerchief .	1 00
1 blue flannel overshirt .	1 60	1 mattress, hair . . .	4 90
2 under-flannel shirts . .	2 32	2 blankets	3 90
2 woollen draws . . .	2 16		
			$31 27

The bedding of the sailor consists of a hammock, mattress, and blankets; pillows and sheets are very rarely included. The hammock is an oblong piece of canvas of appropriate dimensions, which is suspended by small lines or cords, attached to each of its ends, from which they converge to be secured to a hook in a beam of the deck above. The hammock, containing the mattress and blankets, constitutes the sailor's lodging or sleeping apparel, where he lies, almost always parallel with the 'surface of the sea, undisturbed by the rolling of the ship, and not much affected by the pitching, to dream away his "watch below." The hammocks are rolled up in the morning, and stowed for the day around the top of the ship's sides, in a sort of trough, termed the "hammock nettings."

The writer once served in a large frigate where the captain caused the hammocks to be used in common by the two "watches" into which a crew is divided: the hammocks of one watch only were allowed to be hung up at night, and the men who had completed a four hours' watch on deck, occupied the beds just left by those who relieved them, and to equalize the wear and tear of bedding, the hammocks which were hung up one night, were left in the nettings the next. Independently of the objections of a hygienic nature to such a practice, the individuality of men is thus ignored, and they must feel themselves lessened in their self-respect, which for the sake of discipline and general morals of a ship's company, ought to be fostered. Under such a system, a man's bed virtually ceased to be his own property; he was required to share it alternately, first with one and then with another.

The nautical cot is an English invention. It consists of an oblong bag of canvas, stretched over a horizontal wooden frame, so that it has the advantage of a flat surface for the mattress to repose upon, and being suspended like the hammock, yields readily to the motions of the ship. It is useful for the sick, but less so than immovable iron bedsteads, because the canvas sides and ends of the cot obstruct ventilation.

Personal cleanliness is strongly insisted upon. In the social condition neglect of personal cleanliness, by contributing to the mephitism of the air in a ship, becomes detrimental to the health of those with whom one lives. Unfortunately, the scarcity of fresh water on board ships limits sailors to sea-water for their ablutions, which are too generally confined to those parts of the body which are habitually uncovered. The use of tooth-brushes is almost unknown among seamen. Bathing of the entire body is not frequent. Dr. Fonssagrives suggests that in steamers some arrangement might be made to enable every man to have a fresh-water bath once every two or three months.

Our author considers that the moustache and beard should be worn as a protection against vicissitudes of temperature in their influence upon the teeth and respiratory passages.

Washing of clothes on board ship is imperfect. The operation consists in spreading the soiled garment on the deck, smearing it well with soap, and then scrubbing it with a brush, after which it is rinsed in sea-water and exposed to the air to dry. But there is always left in the tissue a deposit of hygrometric saline matter, which prevents it from becoming perfectly free from humidity. The whole system of clothes' washing is objectionable on many accounts besides that just alluded to, and in this connection Dr. Fonssagrives offers a suggestion which the writer would be pleased to see put in practice in the navy of the United States. He submits that at small cost, an apparatus might be placed in every steamer, by means of which washing for the whole crew might be effected by steam. It would be necessary only to provide a metallic box, say four or five feet cube, into which steam could be admitted. Into this box, the soiled clothing, previously steeped a few hours in a weak, alkaline solution, would be placed, and then subjected to the hot vapour. After this it would need to be rinsed, and then the water might be removed by pressure, and then exposed to dry, either in the open air, or in a metallic case suitably arranged, to be heated from the boiler of the engine.

An apparatus of the kind suggested—such as are in use in many hotels—would contribute largely to the comfort and health of the crews of steamers.

The third book treats of nautical influences: the oscillations of the ship from impulse of waves, or rolling and pitching motions, causing sea-sickness, and originating a proclivity to constipation—the influence on the nervous system and on the organ of hearing, of vibrations, caused in ships of war by detonation of guns, by drums and musical bands, the shouting of orders through speaking-trumpets, the conversational noises of a crowd, and the rushing of the wind—are carefully noticed in the first chapter. The second chapter is devoted to a consideration of the composition, temperature and hygrometry of the nautical atmosphere.

The normal composition of the atmosphere by weight is,

Oxygen	23.015
Nitrogen	76.990

besides, carbonic acid from 0.0003 to 0.0006, traces of ammonia, iodine, and a variable quantity of aqueous vapour. Expired air is represented by

Nitrogen	75.2
Oxygen	17.0
Carbonic acid	5.9
Aqueous vapour	19.0

By the act of respiration, the air loses oxygen and nitrogen, and acquires aqueous vapour and carbonic acid; so that confined air, respired by any considerable number of men, or other animals, is greatly vitiated in a very short time.

Applying these data to the atmosphere of the interior of a vessel we find, in a ship-of-the-line of three decks, with the war complement of 1087 men, the entire crew resting five hours "below," by alternation of their watches, that :—

1. 40 grammes of aqueous vapour, 10 of which are derived from pulmonary exhalation, and 30 from cutaneous perspiration, are exhaled every hour by each man, which makes for the entire crew in five hours, 217.400 kilo., or about 580 lbs. Troy.

2. Each man exhaling hourly, 41.43 grammes of carbonic acid, the crew of the same vessel would expire, during the night, 225.172 kilo., or about 600 lbs. Troy of this gas.

3. An adult man absorbs, on an average, 700 grammes of air every hour: in five hours this crew of 1087 men, will absorb 3804.50 kilo., and deprive the air of 228.840 kilo., or about 610 lbs. Troy of oxygen.

4. The 1087 men take from the 3804.50 kilo. of air which they respire during the night, 6.467 kilo. of nitrogen—more than 17 lbs. Troy.

The chemical change of the air in the interior of the vessel during ten hours of night for the crew, or five hours for each half of it, is thus summed :—

Exhalation of	217.400	kilo.	of water
"	225.172	"	of carbonic acid
Absorption of	228.840	"	of oxygen
"	6.467	"	of nitrogen.

It is scarcely necessary to add that sulphurous, ammoniacal, and acid products derived from various animal dejections, miasms furnished by the insensible fermentation of the organic materials constituting the structure of the ship, or resulting from the decomposition of substances supplied as "stores," are so many sources of aërial vitiation which chemical analysis does not reveal; but of these the sense of smell and health are trustworthy re-agents.

Until a recent date, it was usual to attribute all the evils of crowding men to the accumulation of carbonic acid in a confined atmosphere, but, although experiment has proved that carbonic acid when respired is a poison, it is evident, from the proportional quantity being so very small, and equally distributed throughout, under the law of diffusion of gases, that carbonic acid alone is not the cause of the insalubrity of a confined atmosphere.

It has just been stated that 3804.50 kilo. of air are necessary for the respiration of the crew of a three-decked ship, during five hours at night, sleeping below. Now, a cubic metre of air weighing 1226.00 grammes, these 3408.50 kilo are equal to 3103 cubic metres of air. Therefore 3103 cubic metres of air are required on the lower decks of a ship of the first class for the proper respiration of her crew. If she is sufficiently spacious to furnish the crew this amount of air, we may conclude that ventilation is unnecessary; but if, on the contrary, we find a manifest insufficiency of space, an opposite conclusion is inevitable.

The cubage, or cubic space of the three decks of a ship of the line (the orlop is not ordinarily inhabited by the crew in vessels of this class) is 3089.369 metres, from which is to be deducted the cubage of the bodies of individuals (1087×0.64 metres)—it is ascertained that the human body on an average displaces 64.24 litres of water—or 69.568 metres; the cubage of 96 cannons with their carriages, equal to 96.00 metres; the atmospheres circumscribed by partitions and taken from the common atmosphere (ward-room, cabin, hospital, &c.); the cubage of various objects on those lower decks, estimated at about 1,000 cubic metres, making an aggregate of 1165.568 cubic metres. These being deducted, we have 2823.801 metres instead of 3103, necessary to supply the demand of respiration.

These figures demonstrate a necessity for an active ventilation. In this calculation deficiency of air only is considered; but the accumulation of carbonic acid, and of miasms due to absence of its renewal, constitute a condition of mephitism which should not be forgotten.

In view of the fact that atmospheric air is the only substance without which a man cannot live three entire minutes, it is remarkable that so little attention is given to securing a sufficient supply of it on board ships of war, while every care is taken to secure potable water, food, clothing, sleep, without any or all of which a man can survive entire days.

The high temperature in the interior of ships, is not one of the least causes of the insalubrity of their atmosphere. It should be studied separately in sailing ships and steamers; the subject has not yet received the attention it merits. The temperatures of different parts of the ship, and of the external air at the same hours for comparison have not been observed to a sufficient extent to establish any satisfactory conclusions beyond the general fact that the thermometer stands higher on the orlop and in the hold, than upon the gun-decks of ships of the line.

Many causes conjoin to render a ship a centre of humidity. Porosity of the material of construction, a large part of which is submerged; imperfect closing of her seams or joints; penetration of water into the minute canals of the wood, under the influence of the peripheric pressure of the sea on the ship; the accumulation of a considerable number of living beings in a small space (the crew of a ship of the line exhales in a single night 217.400 kilo of aqueous vapour); the preservation of a large quantity of fresh water in vessels imperfectly closed; spray cast aboard from the sea;

age of the vessel—if new, the wood contains more of the water of vegetation, if old, she leaks more; frequent washings of the decks; the humidity of the pelagic atmosphere, hindering the evaporation of moisture accumulated within the ship; in equatorial regions the hygrometric condition of the atmosphere almost constantly approaches saturation.

The conditions of old ships are favourable to humidity, and hence it is that mould and cryptogamic growths of various kinds appear on board of them, in preference to newly constructed vessels.

Humidity is regarded to be among the most active causes of scurvy. All agree that a humid atmosphere is insalubrious, probably because it retards the natural depuration through the skin.

The prophylactic measures recommended are free ventilation; frequent airing of clothes and bedding; rubbing the wood work below decks with dry cloths, &c. And we may suggest that covering the whole berth deck with oil-cloth, similar to that employed in the ward rooms of steamers and other ships, would go far towards obviating humidity below the decks.

The third chapter of this book treats of crowding, infection, contagion and nautical epidemics.

Salubrity of a space is in a measure proportional to the density of its population. Typhus, or ship fever, is attributed to crowding.

Our author defines infection to be aërial contamination from miasm or effluvia which produces disease; it should be carefully distinguished from contagion.

1. Contagion is a peculiar animal principle which is a result of a morbid elaboration, a pathological ovule, which, introduced into a healthy organism, develops a disease analogous to that which produced it. Infection, on the contrary, requires for its manifestation the chemical disaggregation of organic substances, vegetable or animal. Contagion is a pathological poison; infection is a chemical poison; infections become extinguished in the organism in which it germinates, but contagion fructifies there.

2. The first origin of contagion is unknown, but it is rational to suppose that it would be produced only by a spontaneous generation or a metamorphosis of infection.

3. Although there are idiosyncracies which are refractory to the influence of contagion, they are fewer than those which resist infection; *pathological poison* is more general than *chemical poison.*

4. Although long periods of incubation of infectious diseases are cited, we may say, however, that the incubation of contagious diseases ordinarily exceeds those limits.

5. Contagion seems to be transmitted in preference by material communication (contact), infection is transmitted in preference by aërial dissemination. Sometimes, however, contagion is transmitted through the air (smallpox); sometimes also infection is transmitted by contact (putrid infections, corrupted water).

6. Contagion invades successively and by a generally observable filiation, individuals exposed to it; infection on the contrary, impregnates at once and simultaneously most persons submitted to its influence.

7. The propagation of contagion is independent of atmospheric conditions; it is probably in proportion to the completeness of the approximation of the morbiparous organism to the sound organism. The propagation of infection, on the contrary, is subordinate to local circumstances (winds, climate, temperature), which accelerate or retard its diffusion.

8. Contagion generally attacks the same individual only once; infection, on the contrary, does not protect the organism against a new invasion.

9. Contagion may act, by transportation, at considerable distances from the point of primitive departure; but infection does not extend its action beyond a limited radius.

There are four sources of infection; 1. Vegetable disaggregation, or phyto-hæmic infection; 2. Animal putrefaction or necro-hæmic infection; 3. Emanations from diseased organisms, or noso-hæmic infection; 4. Emanations from healthy organisms crowded into a too narrow space, or zoo-hæmic infection.

Phyto-hæmic[1] infection, as its name indicates, proceeds from the introduction into the economy of effluvia disengaged by putrefying vegetable matters.

Marshes are the prolific source of these effluvia, from which originate in hot climates a group of affections so vast and so acute that it has been said that the study of paludal diseases is a key to the pathology of those regions.

It is reasonable that we should find phyto-hæmic infection on board of ships, where an enormous mass of vegetable substance is an incessant site of a silent process of putrid fermentation. If we compare the uncovered marsh with the nautical marsh, we shall find all the circumstances which make the perniciousness of the first united in the hold of a vessel.

The mixture of fresh and salt water is particularly insalubrious; it is this mixture which makes the danger from marshes which improvement has abandoned; it is this mixture also which explains the deleterious influence of the mouths of great rivers in America and Africa; now, the hold is necessarily steeped in brackish water, and hence, there is a most abundant production of paludal emanations.

The moving of a marshy soil augments the diffusion of its effluvia, and so the oscillations of the ship under the influence of waves and storms often reveal the presence of an oceanic infection previously inactive.

To the phyto-hæmic infection are attributed intermittent fevers of various types, remittent fevers, continued fevers, and possibly yellow fever.

Necro-hæmic[2] infection is the morbiparous principle which proceeds from the decomposition of animal matters deprived of life.

The absorption of this principle is capable of producing diseases of very grave character. On board ships necro-hæmic infection frequently arises from putrid decomposition of viands (preserved fresh or by salt), and especially from the pullulation of parasites which fill the hold with their cadavers and deposit there the germs of an inevitable corruption.

Among these ship parasites are cockroaches, rats, and xylophagous animals. The fecundity of cockroaches, as well as of rats, is very great, and at times they become so numerous that it is necessary to suffocate them in mass by sulphur-fumes or otherwise, or abandon the vessel.

Noso-hæmic[3] infection proceeds from crowding sick persons together. The noso-hæmic infection seems to give origin to hospital gangrene, malignant erysipelas, and purulent affections.

Zoo-hæmic[4] infection results from the crowding of living beings, men or inferior animals. Ships carrying passengers or mules, horses, cattle of any kind in numbers largely in excess over the requisite space for their accommodation, are liable to diseases from this infection.

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[1] Derived from Φυτὸν, plant, and αἷμα, blood.

[2] From νεκρος, dead, and αἷμα, blood; poisoning by cadaveric miasms.

[3] From νόσος, patient, and αἷμα, blood; infection produced by accumulating sick persons in narrow limits.

[4] From ζωον, animal, and αἷμα, blood; infection produced by crowding together living beings, men, or lower animals.

Our author presents a summary of the four species of nautic infection, and the diseases attributable to each.

1. *Phyto-hæmic infection.*—Intermittent and remittent fevers, simple or pernicious. Paludal cachexia. Vegetable colic. Yellow fever (?).

2. *Necro-hæmic infection.*—Epidemic dysentery. Certain furunculous eruptions.

3. *Noso-hæmic infection.*—Malignant erysipelas. Phlebitis. Purulent infection. Hospital gangrene.

4. *Zoo-hæmic infection.*—Typhus. Typhoid fevers. Typhoid complications of ordinary diseases.

The prophylactic measures recommended are a rigorous observance of the rules of hygiene, and the use of protective medicines, such as small doses of quinine, wine of bark, &c.

We must pass over his observations on contagion and epidemy without remark.

The subject of rendering ships more healthy is discussed in the fourth chapter of this book.

Ventilation and various plans and contrivances proposed for the aëration of ships are noticed somewhat in detail. In spite of them all, Dr. Fonssagrives seems to think that atmospheric air is doled out to the crew most parsimoniously, while efforts are made to secure supplies of every kind of aliment in ample quantities. Viands, drinks, clothing, may be unexceptionable in quantity and quality, and fail to maintain the vigour and health of men forced to respire an atmosphere deficient in the quantity and quality of those properties which are essential to perfect respiration. Naval constructors seem not to recognize the importance of ventilation of ships; our author's course of reasoning suggests a notion that if port-holes were not essential for the accommodation of guns, and hatches convenient for transfering ammunition to them from the magazines below, there would be no passages provided for the admission of air and light into the interior of the ship.

It is time, says our author, to apply to the objects of naval hygiene the processes of aëration which general hygiene has created, and to ascertain, through the scientific data, which she places before us, in what degree, and by what means the internal air of ships should be renewed.

Dr. Fonssagrives estimates that fresh air should be supplied in the sleeping places of a ship at the rate of 20 cubic metres hourly for every man. He suggests ventilation by aspiration, and that great numbers of air-tubes should be introduced into the structure of the vessel, which should communicate with the hold and berth-deck from the spar-deck, so arranged as to favour a free circulation in the interior of the ship; and that in steamers some contrivance should be connected with the engines to force fresh air into lower parts of the vessel.

He recommends the use of disinfectants, but believes they will be rarely needed where ventilation is sufficient.

Deficiency of light is detrimental to health, and for this reason he suggests the free use of thick glass in the upper deck, and that, where daylight cannot be conveyed below, artificial light from lamps and candles is useful.

The cleansing of ships is treated in detail. He advocates rubbing the lower decks clean with dry sand, or by the process known as dry "holystoning." Although the voice of naval surgeons is almost unanimous against washing the berth-deck more than once in a week or in two weeks, on board of many ships it is daily deluged with water, under a pretext of making it clean and wholesome. A thorough waxing and dry polishing of the berth deck has been suggested, but an oil-cloth covering would better serve the purposes of preserving the health of the ship's company.

Considerable space is devoted to the consideration of the comparative healthiness of different kinds of ships. The conclusions from the statistics are, that sailing ships are very much more salubrious than steamers, and that sickness and mortality augment with the dimensions of the vessel, no matter whether moved by sails or steam.

The fourth book of this treatise is occupied with a statement of the influences on health, which are external to the ship. We cannot follow our author in his observations on the condition of the pelagic atmosphere, its temperature, humidity, and saline properties, nor stop to note his statements about ocean currents, storms, climate, and atmospheric electricity. He treats all these points, not profoundly, though at considerable length.

Nautic Bromatology is the title of the fifth book. Here the author remarks upon the different kinds of potable water—spring, rain, and river, and that resulting from the melting of ice, and of snow. The composition of water, the modes of preserving it on ship-board, water filters, distilled water, and several distilling apparatus are described. Next, there are essays upon French wines, including analysis, modes of detecting sophistications as well as preserving them; French and other brandies; cider and beer; full histories of chocolate, tea, and coffee, with figures of the plants which produce them. Vinegar, lemonade, and lime-juice receive each a brief notice.

Solid food is classified into feculent, sarcose or fleshy, and fatty aliments; condiments close the list.

Under the head of feculent aliments, which are less putrescible than animal substances, we have short essays on flour from different sources; its sophistications, the properties and characters of good flour; panification; biscuit and bread-making machines; the preservation of bread from mould and insects; rice-fecula; tapioca; vermicelli; dried beans, peas; the lentil or *Ervum lens*, from which are derived the *Ervalenta Wharton* and *Revalenta arabica;* pressed and desiccated vegetables.

The sarcose aliments, or viands, include beef, pork, mutton, &c. Speaking of the mode of slaughtering and butchering beef cattle, he states that an ox yields from 54 to 57 per cent. of its living weight in meat, and that the average weight of bullocks of different countries varies from 89 to 269 kilogrammes.

Under the head of preserved viands we have notices of the *carne seca*, *tasajo*, pemmican, tablets of boiled meat, pastils of ozmazome; smoked meats, salted and pickled meats; conserves in vinegar, fatty substances, and in oil, charcoal, and brine. Our author prefers salted pork to beef, which he thinks might be advantageously reduced in quantity, or totally omitted from the seaman's ration. It is well known that beef packed for the use of our navy gradually and progressively indurates with age, and after three or four years, loses its nutritive qualities in a very great degree. The animal tissue seems to form a compound with the salt, partaking somewhat in appearance, at least, a chemical character. Indeed, salt merely retards but does not absolutely prevent the decomposition of animal tissue, as the records of the government exhibit in the quantities annually condemned to be thrown away.

The fatty aliments include milk and cheese; and under the head of condiments our author places salt, vinegar, lime-juice, peppers, mustard, spices, sugar, olive oil, butter, &c.

M. F. urges that variety in the nautical ration is more essential to health than quantity or even quality, and that the appointed hours of meals should be different. He suggests that six o'clock in the morning for breakfast, eleven A. M. for dinner, and six P. M. for supper would be better adapted to seamen than eight, twelve, and four o'clock for those meals. Those who are called to the midwatch (from midnight till four o'clock A. M.) might have furnished to them a light repast, a biscuit and coffee, for example, advantageously to health.

The elementary composition of the ration and the modes of preparing or cooking it are duly noticed. The book ends with notices of certain tropical fruits, poisonous animals, fish, &c. Speaking of antiscorbutics, he remarks that scurvy has its cause in many combined circumstances; in vitiated or insufficient air; in a long privation of telluric influences; in depressing passions, as well as in imperfect alimentation; and, consequently, there is, properly speaking, no antiscorbutic, as there is an antisyphilitic medicine. The remedy for scurvy is found in all favourable hygienic influences, just as its cause is found in all hygienic influences which are unfavourable to health. And so true is this that different elements of hygiene have been in turn and rightfully accused with the production of different epidemics of nautical scurvy. How often have we seen ships, but little crowded, pay their tribute to scurvy because they had long been without fresh provisions. How often, on the contrary, have we seen an abundance of fresh vegetables fail to prevent the scourge under hygienic circumstances in other respects unfavourable. Two vessels upon the same station, supplied in the same manner; the crew of one, under a mild and paternal discipline, finds in its cheerfulness an effective element of resistance; the crew of the other languishes in nostalgic torpor, and scurvy decimates it. This comparison is not a fiction, but an actual observation. Let no one suppose, however, that we seek to undervalue the influence of a badly constituted or insufficient alimentation in the production of scurvy; no one appreciates more fully than we do, this etiologic element, but we are unwilling to attribute to it or to any other an exclusive action which does not pertain to it. Scurvy is a grave perversion of the nutritive function; nutrition owes its integrity and its deviations to other causes than to the materials of food; all external and moral influences co-operate simultaneously, and in them all we must seek both for the cause and remedy of scurvy at the same time; and ventilation, disencumbering, drying the ship, abbreviating cruises, frequent returns to port, mildness of the disciplinary yoke, cheerfulness, frequent reception of news and letters, are the *antiscorbutics* which, in our opinion, have more curative efficacy than the cress, cochlearia, lime-juice, or the salts of potassa.

Nutrition always suffers, whatever may be its alimentary resources in other respects, *if its elements are long removed from the influence of life.* There is in blood which has just lived, as in sap which has just circulated, an analeptic and restorative power which nothing can replace. Fresh or *recent* viands and vegetables are the two antidotes to scurvy; its appearance is imminent whenever they are long wanting. It must not be forgotten that from the moment life abandons an organic alimentary substance, chemical force takes its place; its molecular operations, silent, hidden, slow but real, produce changes which health wonderfully appreciates long before the gross limit of commencing putrefaction which alone strikes our senses.

The most perfect conserves are in this category; their chemical condition is not that of fresh aliment, and nutrition quickly perceives it. Here is the part which must be referred to aliments in the production of scurvy; insufficient though *fresh* nutriment will beget anæmia; a sufficient nutriment but in the process of slow chemical decomposition will engender scurvy.

If such is one of the sources of the scourge of ships, we should take every care to combat it, by diversifying as much as possible the monotony of preserved vegetables and viands by green vegetables and fresh meats, the only alimentary antiscorbutics which we recognize. The seaman's ration is richer, more reparative than is necessary to maintain his health and strength. How comes it then that it is not sufficient? It is not that he needs only so many equivalents of nitrogen or carbon daily, but especially demands that these elements may have chemical groupings which approximate those which they held during the *life* of the alimentary substances. It is in this the ration fails, and which we should give to it as frequently as possible.

The extreme hygienic importance of supplying to crews in port the fresh meat of mammals or fishes is insisted upon. Green vegetables are not less indispensable, and instinct very often induces sailors to seek with avidity this food, even in defiance of a normal repugnance. Whalemen eat with relish raw potatoes, the leaves of the least edible vegetables; those which have no green part are unsavory to the sailor thirsting for vegetable sap.

The sixth and last book into which the work is divided is devoted to the moral influences to which sea-faring people are subjected.

Separation from friends, and the rupture of habits and of affections, forced approximation with strangers who may not be congenial are special influences on nautical life, from which may arise weariness, hypochondria and nostalgia. Each of these is duly treated. The influence of the passions, emotional maladies, amusements, discipline, punishments, authority and obedience on board ship are separately considered, but the writer has already exceeded the limits he proposed to himself in preparing a sketch of the contents of this volume, which he recommends to the study of nautical practitioners. The work is perhaps chargeable with prolixity and an over ambitious style, but the fulness of detail, and the many bibliographic references it contains compensate for these faults. W. S. W. R.

ART. XIII.—*Clinical Essays.* By BENJAMIN W. RICHARDSON, M. A., M. D., Senior Physician to the Royal Infirmary for Diseases of the Chest. Vol. I. JOHN CHURCHILL, 1862. 8vo.: pp. 272.

DR. RICHARDSON'S name is familiar to medical readers on this side of the Atlantic, as the author of a work on the *Cause of the Coagulation of the Blood*, which gained the Astley Cooper prize, for 1856. This work has been reviewed by an able hand, in a former number of this Journal.[1] Dr. Richardson's explanation of the liquid state of fibrin in the blood, viz., that it is due to the presence of ammonia, if true, has important practical applications, and, in the work referred to, subjects of much importance, in a practical point of view, are incidentally introduced; we may mention par-

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[1] Number for July, 1858, p. 139 *et seq.*